CLAIMS

1. A method of producing a piezoelectric thin film device in which a piezoelectric laminated structure including a piezoelectric thin film, an upper electrode and a lower electrode formed on the upper and lower surfaces of the film, respectively, is supported by a substrate, and in which a space for oscillation is formed to allow the oscillation of the piezoelectric laminated structure, comprising:

a step of forming an insulating layer capable of being etched by a specific chemical substance on the upper surface of the substrate;

a step of forming a sacrificial layer made of a substance having a higher etching rate by the specific chemical substance than the insulating layer on a partial region of the insulating layer;

a step of forming a lower electrode on a region including a part or entirety of the sacrificial layer;

a step of forming the piezoelectric thin film on a region including a part of the lower electrode;

a step of forming an upper electrode on a region including a part of the piezoelectric thin film;

a step of forming via hole so as to expose a part of the sacrificial layer or a part of the insulating layer provided under the sacrificial layer; and

a step of forming the space for oscillation by etching both the sacrificial layer and the insulating layer provided under the sacrificial layer with the same specific chemical substance by introducing the specific chemical substance through the via hole.

2. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein the via hole is formed to penetrate at least one of the lower electrode, the piezoelectric thin film and the upper electrode to expose a part of the sacrificial layer.

3. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein the via hole is formed to penetrate the substrate to expose a portion of the insulating layer.

4. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein material of the insulating layer contains a silica glass or a silicate glass as a main component, and material of the sacrificial layer is titanium.

5. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein the material of the insulating layer is aluminum nitride, and material of the sacrificial layer is aluminum.

6. The method of producing a piezoelectric thin film device as claimed in claim 1, further comprising a step of, after forming the sacrificial layer, laminating a second insulating layer made of a substance having a smaller etching rate by the specific chemical substance than the insulating layer on the sacrificial layer and the insulating layer.

7. The method of producing a piezoelectric thin film device as claimed in claim 6, wherein material of the second insulating layer is a nitride or oxynitride insulator containing aluminum nitride or

silicon nitride as a main component.

8. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein a thickness of the sacrificial layer is 20 nm to 600 nm.

9. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein a thickness of the sacrificial layer is 20 nm to 90 nm.

10. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein a surface roughness of the upper surface of the sacrificial layer is 5 nm or less by RMS variation in height.

11. The method of producing a piezoelectric thin film device as claimed in claim 1, wherein a thickness of the insulating layer is 500 nm to 3000 nm.

12. A piezoelectric thin film device in which a piezoelectric laminated structure including a piezoelectric thin film, an upper electrode and a lower electrode formed on the upper and lower surfaces of the film, respectively, is supported by a substrate via an insulating layer, and in which a space for oscillation is formed to allow the oscillation of the piezoelectric laminated structure, characterized in that a surface roughness of a lower surface of the lower electrode is 5 nm or less by RMS variation in height, and an upper surface of the insulating layer is disposed lower than the lower surface of the lower electrode in the space for oscillation and

positioned above a lower surface of the space for oscillation.

13. The piezoelectric thin film device as claimed in claim 12, wherein an interval between the upper surface of the insulating layer and the lower surface of the lower electrode in the space for oscillation is 20 nm to 600 nm.

14. The piezoelectric thin film device as claimed in claim 12, wherein an interval between the upper surface of the insulating layer and the lower surface of the lower electrode in the space for oscillation is 20 nm to 90 nm.

15 The piezoelectric thin film device as claimed in claim 12, an interval between the upper surface of the insulating layer and the lower surface of the space for oscillation is 500 nm to 3000 nm.